U.S. PATENT APPLICATION

For

METHOD FOR CAPTURING OF REAL-TIME IMAGE

Inventors: RYU, Jung-Hee

KWON, Dong-Jin

METHOD FOR CAPTURING OF REAL-TIME IMAGE

Technical Field

[0001] The present invention relates to a method allowing a user terminal
to capture of an image recorded in various media in real-time. More particularly,
the present invention relates to services wherein a user terminal captures a code
image recorded in various on-line/off-line media in real-time, decodes the code
value, and obtains desired information using that decoded code value.

Background Art

[0002] Recently, multimedia has been used in various portable terminals
and systems. A variety of contents are provided and utility services activated
using such multimedia. In particular, the ability to pick up and to edit a motion
picture becomes available in home appliances due to the spread of the use of
digital cameras and camcorders.

[0003] In existing still image decoding systems, in the event an image is
captured in real-time, a still image capture using the snapshot is used. That is,
in the case where a motion picture is captured, the image is captured in a
compressed JPEG format, resulting in a data transfer rate reduction. If a user
desires to store the image in real-time, a problem occurs in that the image is
broken. This is due to the rate in which images are stored, which is
approximately every 1/15 of a second. In addition, users become
inconvenienced when capturing the image in real-time due to a reduced sensible

rate.

[0004]   A process of capturing a still image and processing the image in the related art will now be described in detail with reference to FIG. 9.

[0005]   A method for capturing a pause image of one cutting in a portable terminal having an image capture means such as a CCD camera is as follows.

[0006]   A preview screen is executed on a viewfinder and a user then confirms the preview screen while viewing the viewfinder (S901).

[0007]   If the user catches a desired object while executing the preview screen (S903), the user is able to capture a snapshot using a pickup input button, or its equivalent , provided on the device. In its dictionary meaning, the term snapshot refers to the instant pickup of a moving object or its picture. In order to capture a still image, the user: 1) executes the viewfinder preview screen (S901); 2) catches the desired object (S903); and 3) depresses the pickup input button, so that a pause image of one cutting is instantly obtained from the preview screen (S905).

[0008]   The snapshot image captured, as described above, is usually stored in the user terminal, in a compression format such as JPEG (S907).

[0009]   As such, steps S901 to S907 describe the conventional method (S900) for capturing a still image.

[0010]   The image data, which were compressed or stored through the still image capturing method (S900), are secondarily utilized in the user terminal through a subsequent image-processing-process (S910). Secondary utilization means that in case of a barcode image, information written in barcode is

decoded and is then connected to a corresponding application, so that it can be used to remodel and to decorate the still image through the preview image. Such an image-processing-process is described as follows:

[0011] Image data compressed or stored in JPEG format, etc., are

5   decompressed (S911).

[0012] The snapshot, being the decompressed image data, is analyzed (S913) and decoded.

[0013] If the snapshot is successfully decoded (S915), a corresponding result value is returned, thereby completing the image-processing-process

10 (S917).

[0014] However, if the snapshot is unsuccessfully decoded (S915), the process returns to the step of executing the preview (S901) in order to   obtain a new snapshot.

[0015] In reality, image data to be decoded have to be captured to such a

15 degree that a snapshot corresponding to an image at the time when the image is picked up is decodable. It is often the case that a user is unskilled in using the device, or due to other factors, obtains a still image that is improper for decoding. As a result, the probability a good and desired snapshot can be obtained is very low. Therefore, the difficulty lies in that the user must return to

20 the pickup mode several times until decoding is successful. Thus the user has to repeat the still image capturing process. In this case, a problem occurs in that preview re-execution for other purposes becomes impossible until the image is successfully processed.

[0016]   Still another problem occurs in that normal re-execution of the preview screen is impossible until the image processing process is successfully performed. This is because a paused preview image, which remains in a LCD buffer region, etc., is employed in an image-processing module upon pause of the preview. Another problem occurs because the ability to update a new preview image is hindered until the image-processing-process (S910) is normally finished. In this case, the user can do nothing while the image is being processed, resulting in a significant waste of system utilization ability.

[0017]   As described above, the method for capturing the still image in real-time according to the prior art has problems in that significant amounts of time and effort are wasted due to the unskilled manipulation of the user terminal; execution of the preview screen is paused until the image-processing-process is finished; and the user must continuously perform the snapshot capturing process until the image is normally processed.

[0018]   An inventor of this application filed a patent application (Korean Patent Application No. 2000-0085811, December 29, 2000), disclosing the configuration of a pattern having code information, and a coded pattern wherein an image of the pattern is captured using a camera and a code is extracted from the image and code extraction method thereof. In this patent, a barcode of a two-dimensional structure is captured by various devices each having a camera and a code is extracted from the barcode.

[0019]   Furthermore, the inventor filed a patent application (Korean Patent Registration No. 10-0323759), disclosing a device wherein a specific code is

extracted from a pattern image using a mobile communication device having a camera, and information is displayed on the device according to the code or provided through a communication network, and the method thereof.

[0020]   Incidentally, the inventor filed a patent application (Korean Patent Application No. 2000-0032164, June 12, 2000), disclosing a method and system for providing information on an object containing an ID symbol that is physically readable. In the method and system, a virtual space is searched for information on an object existing in a real space, information on a predetermined product or the like through a network, and the search result is then provided to a user.

[0021]   The aforementioned prior arts are intended to provide various information and related services over the entire real life by allowing a user terminal to capture a code image, whereas the present invention is intended to provide a method for allowing a user terminal and various systems to capture a code image and process the image in a more advanced manner.

Disclosure of the Invention

[0022]   Accordingly, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a method for capturing and processing a still image in real-time using various image capture devices such as a CCD camera, a digital camera, etc. More particularly, an object of the present invention is to capture rapidly a still image from a preview image upon capture of that image, to process the captured image, and

then to apply the processed image to various applications.

[0023]   To achieve the above objects, the present invention provides a method for capturing a predetermined image frame in a system having an image capture means, including the steps of: allowing the image capture means to pause a preview; copying and storing the paused preview image; and after the still image is stored, re-executing the preview before the processing the stored image begins.

[0024]   Furthermore, if the image that is copied and stored in the still imaging storing step is in a compressed format, the method for capturing the still image in real-time further includes the step of decompressing the image after the preview re-execution step, wherein the image processing in the step of decompressing the image does not affect   preview re-execution.

[0025]   Also, to achieve the above objectives, a method is provided that captures a predetermined image frame in a system having an image capture means, including the steps of: inhibiting writing into an image buffer region of a image storage unit within the system; subjecting the image stored in the image buffer region to a Crop and Resize process in order to copy the processed image to other regions of the image storage unit; and permitting writing into the image buffer region of the image storage unit, where, in a state in which the image preview is continuously activated, a real-time still image is captured by controllably activating and inactivating writing of the still image into the image buffer region.

[0026]   Furthermore, a method is provided that provides services using a

code image, including: a code image capture step using the method for capturing the still image in real-time according to the present invention; a decoding step allowing an image processing unit to decode the code image captured through the code image capturing step and to extract a code value;

5   **[0027]**   a URL call step of allowing a system browser to call a URL associated with the code value to a host server associated with the system; and a step of allowing the host server to search the URL or contents corresponding to the code value, to send the searched result to the system, and then to receive related services from the system.

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Brief Description of Drawings

[0028]   Further objects and advantages of the invention can be more fully understood from the following detailed description taken in conjunction with the accompanying drawings in which:

15   **[0029]**   FIG. 1 is a flowchart of a general application using a preview image in a variety of applications using a camera;

[0030]   FIG. 2 is a block diagram illustrating a system having an image capture means according to an embodiment of the present invention;

[0031]   FIG. 3 is a block diagram illustrating a system having an image

20   capture means according to another embodiment of the present invention;

[0032]   FIG. 4 is a block diagram illustrating a system having an image capture means according to still another embodiment of the present invention;

[0033]   FIG. 5 is a flowchart illustrating a method for capturing a still

image according to an embodiment of the present invention;

[0034]   FIG. 6 is a flowchart illustrating a method for capturing a still image according to another embodiment of the present invention;

[0035]   FIG. 7 is a flowchart illustrating a method for capturing a still image according to still another embodiment of the present invention;

[0036]   FIG. 8 is a flowchart illustrating a method for capturing a still image according to still another embodiment of the present invention; and

[0037]   FIG. 9 is a flowchart illustrating a process of capturing and processing a still image in the related art.

Best Mode for Carrying Out the Invention

[0038]   The present invention will now be described in detail in connection with preferred embodiments, with reference to the accompanying drawings.

[0039]   FIG. 1 is a flowchart illustrating a process of a general application using a preview image in various applications employing an image capture means such as a camera.

[0040]   At the start step (S101) of the application, the application is initialized and the image capture means, such as a camera, is initialized. A method for executing an application loop (109) may include a simple repetition method based on an end condition search, as shown in FIG. 1, or a method using a timer in order to repeat tasks within the application loop. In the timer-method, if a timer indicating an event that executes the application loop is

called at the application start step (S101), a timer event is generated in a predetermined time interval. Thus, in the timer-method, the tasks are executed only once when the timer event is generated without repeating various initialization task steps (S103, S105 and S107) within the loop after searching

5 the end condition search step (S107), unlike the simple repetition method based on the end condition search. Next, if the condition is satisfied in the end condition search step (S107), an end step (S115) is performed. Whenever the event is generated, the initialization task steps (S103, S105 and S107) are executed only once. If the end condition is satisfied in the end condition search

10 step (S107), the process is repeated. In addition, even if the end condition is not satisfied, the process does not repeat the loop.

[0041]   If the initialization and the start are accomplished, an image is captured through the image capture means, such as a camera (S103). In order to capture an image of one frame through the image capture means with a

15 preview image displayed, a variety of methods can be used. The present invention aims at the image capture process. A variety of methods are applicable to one system. Further, the present invention aims at an image capture method wherein the image can be selected more rapidly with an interval of some time left in bringing the image. Detailed description will be made in a

20 corresponding portion with reference to the corresponding drawings.

[0042]   If the image is captured, the captured image is processed in an image-processing-unit according to a corresponding application (S105). The image is processed in a variety of formats according to the corresponding

application. Examples of the application may include a code image recognition application, a motion picture encoding application, a character recognition application, applications such as image decoration and remodeling, and the like.

[0043] After the image processing step (S105) is completed, a determination is made whether to repeat the application loop (S107). If the end condition is satisfied after searching the end condition of the loop (109), the application is completed (S115). If the end condition is not satisfied, the process returns to the image capture process (S103) and the loop is repeated until the condition is satisfied. When a timer event is used in order to repeat the application loop, a corresponding timer is paused to finish repetitive tasks of the loop in the end step (S115).

[0044] The general application using the preview image shown in FIG. 1 includes the loop (109) wherein some steps of an application program are repeatedly performed until a predetermined number or a predetermined condition is satisfied when the programs are executed.

[0045] A method may implement the loop (109) where: an event procedure of an application receives the timer event; a method wherein the process exits the loop while continuously performing a "For" sentence; and the like. If the loop is implemented by the method wherein the event procedure of the application receives the timer event, a timer interval is sufficiently given considering a one-time execution time of the loop. If the loop is implemented by the method wherein the process exits the loop while continuously performing the "For" sentence, the loop can be implemented by giving some room to the

system considering an adequate sleep time. In this case, the process of starting and ending the timer is not required.

[0046] If the application is finished (S115), the timer is first paused and the preview of the image capture means, such as a camera, is then paused. Further, if memory is allocated in the initialization process, the process of releasing the memory may be performed.

[0047] In the present invention, by using the above method, it is possible to perform repeatedly and automatically the still image capturing process, and to process the image until the decoding is successful within the device, without performing manual tasks such as additional pickup. This is in contrast to the prior art described with reference to FIG. 9.

[0048] A system to which the application is usually applied, such as the user terminal having the camera, will now be described.

[0049] The system of the present invention has a means capable of capturing an image from a digital camera, a camcorder, a CCD camera, a photosensor, etc., and preferably refers to a portable wireless device such as a PCS, a cellular phone and an IMT 2000 device having a network transfer means, a notebook, a personal computer, a PDA, an OCR, and the like. That is, the system may include a variety of devices having an image capture means and an image processing means, and all the devices having a communication means. Digital image capture devices such as an existing digital camera and camcorder are also included in the system of the present invention. However, the system of the present invention is not limited to the aforementioned devices having

such communication means.

[0050] FIG. 2 is a block diagram illustrating the system having the image capture means according to an embodiment of the present invention.

[0051] The system shown in FIG. 2 is an example of a general system, which can capture a still image in real-time. The system includes an image capture module (201) for capturing a variety of images from the outside, a camera IC (203) for processing the captured images outputted from the image capture module, a variety of display units (205) of an image output means such as an LCD, CRT and liquid crystal, a storage unit (207) for storing data such as an image therein, and a control operation unit (215) for controlling the system, wherein the control operation unit has various operations.

[0052] The system shown in FIG. 2 is an example of a system having a CPU whose performance is relatively low. In case of a CDMA or a GSM device using a CPU core of ARM7 series, an image is distributed and processed in the hardware in order to reduce the load of the CPU, and the processed image is outputted to the display unit.

[0053] FIG. 3 is a block diagram illustrating the system having the image capture means according to another embodiment of the present invention.

[0054] The system shown in FIG. 3, unlike that of FIG. 2, is an example of a system having a CPU core of the ARM9 series whose performance is relatively high. In this system, a control operation unit (315) directly controls the display unit (205). If the main function of the control operation unit (315) is image processing, a system having another control operation unit that is

connected to an interface of the control operation unit (315) is possible. For example, a system in which the main function of the control operation unit (315) is image processing and a modem chip is interfaced to the control operation unit (315), is possible. A representative one is 3G technology, which corresponds to a W-CDMA device having a camera, wherein W-CDMA employs CDMA instead of TDMA in order to increase the data transfer rate of the GSM system.   The W-CDMA becomes a DS mode in 3G rules of ITU and includes 1x MC (multicast mode) and 3x MC.

[0055]   FIG. 4 is a block diagram illustrating the system having the image capture means according to still another embodiment of the present invention.

[0056]   The system shown in FIG. 4 is an advanced system in which the relationship between a control operation unit (415), an image capture module (401), a display unit (205) and a storage unit (207) becomes smoother when compared to the systems shown in FIGS. 2 and 3. That is, the image capture module (401) can directly control the display unit (205), and the control operation unit (415) can control the image capture module (401) and the display unit (205). In this process, the storage unit (207) can be utilized in a more free and varying manner.

[0057]   The method for capturing the still image in the systems in FIG. 2 to FIG. 4 will now be described in detail. That is, the image capture process (S103) among various application processes using the camera in FIG. 1 will be described using the accompanying drawings.

[0058]   FIG. 5 is a flowchart illustrating a method for capturing a still

image in real-time according to an embodiment of the present invention.

[0059] An image capture means provided on a system pauses a preview (S501).

[0060] In the preview pause step S501, in order for an image capture means such as a camera to capture a still image, a preview pause function, if any, is used. If there is no preview pause function, a preview stop function is used.

[0061] The image paused in the preview pause step (S501) is moved to the system's storage unit, and a still image is captured from the image (S503).

[0062] In the case where the image capture means, such as a camera, scatters a preview image on a display unit, such as an LCD, if a camera preview is paused, a preview image remains in the system LCD buffer region. Therefore, if a range in which the preview is scattered in the LCD buffer region is found, the preview image can be obtained. Generally, the format of the images is the same as, for example, a LCD color representation mode of an RGB format, etc., and the resolution of the image is the same as the resolution of the preview displayed on the LCD. The above will be described in more detail. If the preview is paused, a preview image paused in the LCD buffer region remains. In the present invention, the preview image paused in the LCD buffer region is copied to other storage space on the system so that the image can be used in the image processing process. Currently, the reason the still image for the image processing is copied to other storage space is because the image processing does not affect execution of the preview. The storage space to and

in which the preview image paused for image processing is copied and stored may have only a different address on the memory where the original pause preview image exists. The preview image can be copied and stored in an additional storage space. In a corresponding section, this will be described in

5   more detail.

[0063]   After the still image capture step (S503), the preview is re-executed before processing of the captured image begins (S511). In the event the preview is paused using the preview pause function, a preview resume function is executed. To re-execute the preview before the image processing

10   begins is for minimizing that a screen is broken or paused by first executing the preview since the routine of the subsequent image processing step (S105) is a time-consuming task that requires lots of time.

[0064]   If the image is captured and the data are transmitted by means of the method shown in FIG. 5, the data transfer rate can increase and the

15   breakage or screen pause can be prevented when compared to the prior art using the compressed image, such as the JPEG format, and using the existing snapshot.

[0065]   According to an embodiment of the present invention, the system having the image capture means is the system having the camera IC (203),

20   which directly controls the display unit (205), as shown in FIG. 2. The region where the still image is captured/stored in the still image capture step (S503) is the system storage unit (207), more particularly, RAM, etc., connected to the control operation unit. The stored image has the same resolution as an image

outputted from the display unit. That is, if the camera preview is paused (S501), an image at the moment when the preview image is paused remains in the image buffer region within the camera IC. It is thus possible to capture rapidly the preview image by reading that portion. Further, the paused preview

5   image read from the camera IC image buffer region is copied and stored in the storage unit connected to the control operation unit (215). By utilizing the newly stored image in the image processing, the preview can be normally executed without the effect from the image processing. Usually, the format of these images is the same as the color representation mode shown in the LCD.

10   In addition, the resolution of the image is the same as the resolution of the preview displayed on the LCD. Accordingly, an output image recognized by the image capture means undergoes a Crop and Resize process by means of the camera IC and is then outputted on the display unit. In this embodiment, the cropped and resized image is brought.

15   **[0066]**   The term Crop refers to the function of extracting an image from the entire image.   The term Resize refers to the function of changing the size of the entire image.

[0067]   According to another embodiment of the present invention, the system having the image capture means is the system in which the control

20   operation unit (315) directly controls the display unit (205), as shown in FIG. 3. The output image of the image capture means, such as a camera, is stored within the system storage unit (207). The camera output image, which is a stored original image, goes through the Crop & Resize process, and is then

copied to another storage unit (207) region. Usually, the image format is the same as the camera output format, etc. For example, the format may be a YUV format, etc. The YUV format is a format often used in TV broadcasting, conceived on the fact that the human eye is more sensitive to luminance than color. Y indicates the luminance of a color and is sensitive to error. Thus, Y is coded at an upper bandwidth than are the color elements U and V. U and V refer to chroma. The typical Y:U:V ratio is 4:2:2, which is also used in CD-I and DVI.

[0068]   FIG. 6 is a flowchart illustrating the method for capturing the still image according to another embodiment of the present invention.

[0069]   The embodiment shown in FIG. 6 corresponds to the method used when it is desirable to capture an image with a resolution higher than that of a preview image.

[0070]   An image capture means provided in a system pauses a preview (S501).

[0071]   In the preview pause step (S501), like in the embodiment of FIG. 5 described above, an image capture means, such as a camera, uses a preview pause function to obtain a still image.. If no preview pause function exists, a preview stop function is used to obtain the still image.

[0072]   In the event it is desired to obtain an image with a higher resolution than that of the preview, a Crop and Resize condition is specified and a capture command is issued to the Camera IC 203 (S602).

[0073]   In this case, the corresponding captured image is stored within

the camera IC 203 image buffer region, according to the specified Crop and Resize condition. The image stored with the camera IC's (203) image buffer region is read through the preview pause step (S501) and the capture command (S602) step, and is then stored in the storage unit (207), so that a still image is captured (S503). A process such as a subsequent preview re-execution step (S511) is the same as that described above and will not be described further.

[0074]   This embodiment corresponds to a method that can be used when an image having a higher resolution than that of a preview image is to be used, such as when the image capture means output image is used intact.

[0075]   FIG. 7 is a flowchart illustrating the method for capturing a realtime, still image according to still another embodiment of the present invention.

[0076]   In this embodiment, in a state where the preview image is continuously received instead of the preview pause and re-execution steps in the aforementioned embodiment, a write of the image from an image capture module to a buffer region of a storage unit is inhibited and activated.

[0077]   That is, this embodiment corresponds to a method wherein a preview is updated as time elapses, but the image buffer is not updated, and a still image is captured through control of write inhibition and activation.

[0078]   The system control operation unit controls the system storage unit to inhibit writing into the image buffer region (701). At this time, the image stored in the image buffer region is subjected to the Crop and Resize process and is thus copied to another system storage unit region. The image copied to

the other region is read to obtain the still image (S503).

[0079]   After the image is copied to the other region, the control operation unit controls the system storage unit to activate writing into the image buffer region (S711).

5   [0080]   In a state where the preview image is not paused and executed but is continuously received as above, the storage unit of the system is controlled to control write inhibition and activation of the image buffer region. It is thus possible to obtain a more rapid still image by comparing the preview image with the still image through the pause and execution.

10   [0081]   FIG. 8 is a flowchart illustrating the method for capturing the still image in real time according to still another embodiment of the present invention.

[0082]   In this embodiment, if an image format that can be obtained from the camera IC, etc. is in a compressed format such as JPEG, an image

15   decompression step (S813) is further added to the image capture process described above.

Application Example

[0083]   The process of capturing and processing an application-related image will now be described.

20   *Application Example Using Code Decoder*

[0084]   An application is initialized. At this time, a code decoder is initialized and a camera preview is started. A timer may be called and started, if necessary.

[0085]   After initialization, the image capture unit performs the aforementioned still image capture process to capture a still image.

[0086]   The image processing unit performs a decoding process to recognize the code by using the still image captured in the image capture unit as an input. The code image decoding process corresponds to the process of extracting a code value through the code image captured in the image capture unit. Such a code decoding process may be executed in a variety of methods depending on the format of the code image. If the decoding fails, the image capture unit captures a new image. If the decoding is successful, the process exits the application loop to finish the code decoding.

[0087]   After a code value is decoded through the code image, if the recognized code value is outputted to the decoder, a browser that supports the HTTP protocol such as a web browser, a WAP browser or a ME browser calls a URL and the URL is then executed.

[0088]   The URL called through the browser has the following format:

[0089]   [protocol   name]://[host   server   name]/[switching   software name]?[code value factor name] = [code value]

[0090]   For example, the URL may have the following format:

HTTP://sw.hot-code.com/sw.sap?code = 12345678

[0091]   In this case, other factors such as the type of code may be additionally added to the URL.

[0092]   In other words, for example, the URL may have the following format:

HTTP://sw.hot-code.com/sw.sap?code=12345678&type=EAN

[0093]   If the code value is called as above, software of the host server searches a database for the URL corresponding to the transmitted code value and then redirects the URL, or searches the database for contents to be connected and then generates a medium page connected thereto, so that the page can be viewed through a requester's browser.

[0094]   Through the above method, a web, WAP, ME page, picture, background downloading, bell sound downloading, connected communication sound settings, various virtual machine support applications such as games, VOD, MOD, making a phone call, entry of personal information into an address book, editing of the address book, and other services can be provided to a user on a system browser.

2. *Optical Character Recognition*

[0095]   Optical Character Recognition (OCR) refers to those letters, symbols, marks, etc., that are printed or hand-written onto paper, recognized by an optical means, and then converted into computer text. The OCR scheme includes a pattern contrast method and a stroke analysis method. Recently, the use of a methodsuch as hand-written character recognition has increased. OCR may use a special read device, or may use a small-size optical scanner and dedicated software. In a character recognition application, like with the code recognition application described above, after the application is initialized, a character image capture unit properly performs the still image capture process described above to capture a still image.

[0096]   The image processing unit performs the character recognition process through a predetermined method such as the method described above by using the still image captured in the image capture unit as an input. If the character recognition process fails, the image capture unit captures a new image. If the character recognition process is successful, the image capture unit exits the application loop to finish the process.

3. Image Remodeling and Decoration

[0097]   A user can remodel or decorate the still image captured with the digital camera, the camcorder, etc., using an appropriate tool.

[0098]   That is, after the image is captured as described above, the image processing unit deforms and decorates the still image using image remodeling and decorating tools and then finishes the process.

[0099]   The applications are only exemplary processes of capturing and processing the image related to the application of the present invention. The spirit of the present invention is not limited to the application examples. That is, the method of capturing the still image in real time according to the present invention is not limited to the application examples, but can be applied to a wide range of applications if they fall within the method for capturing the still image in real-time according to the present invention.

Industrial Applicability

[00100]   According to the present invention, a still image is captured in real time through an image capture means such as a CCD camera and a digital camera. More particularly, it is possible to capture and process a still image

more rapidly using a preview image when the image is captured.

[00101]   Therefore, the present invention allows a user to perform a code image decoding process more rapidly using the image capture method through a behavior that makes an image such as a code optically touch a camera and to receive services associated with a desired code more rapidly and conveniently. Furthermore, the present invention can be applied to various applications such as character recognition, real-time image remodeling and editing, etc.